The Northwestern MILLER

MILLING PRODUCTION SECTION

Comparative Milling Results Using Silk, Nylon and Stainless Steel Bolting Sieves in the Buhler Laboratory Mill

By E. F. Seeborg, H. W. Baker, J. De Haan, H. K. Heizer and W. V. Van Scoyk

Certain objectionable characteristics of silk bolting cloth and the increasing commercial use of nylon and stainless steel to replace silk bolting cloth in flour mills of the U.S. have made it desirable to study these sieves with laboratory milling equipment. The Buhler laboratory mill (3) is a continuous flow machine that could be easily used for such a study.

Mattson (2) reported recently on a comparison of stainless steel and silk bolting cloth. He noted that silk showed a gradual decrease in bolting capacity during use. Lawson (1) measured 11XX bolting cloth after 30 months of use and found the average aperture opening to be 16.8% smaller than when new. This same change in bolting capacity of silk with use has been noticed by operators of experimental mills. Lawson ascribes this loss in capacity equally to the decrease in opening size and to adherence of a "substance" to the silk threads, which facts give the old silk a greater coefficiency of friction than new silk. Microscopic examinations of new and used silk (10XX) at the Western Wheat Quality Laboratory agree with the conclusions of Lawson and Mattson. Figures 1 and 2 are photomicrographs of new and used 10XX silk. Figure 2 is a section from the third break sieve of the Buhler mill that has been used for six months, milling mostly soft wheat. Figure 3 is a photomicrograph of 135 mesh stainless steel and Figure 4 shows the 130 mesh nylon, both new. The nylon and stainless steel had not been in use long enough to get pictures comparable with Fig. 2. Mattson states that stainless steel does not lose its bolting capacity as silk does and thus far there is no indication that it will get a "fuzzy" characteristic such as silk has in Fig. 2.

EDITOR'S NOTE: The accompanying article is the text of a report by the Soft Wheat Sub-Committee of the Committee on Experimental Milling Procedure, American Association of Cereal Chemists. The paper also was published in the October issue of the AACC Transactions.

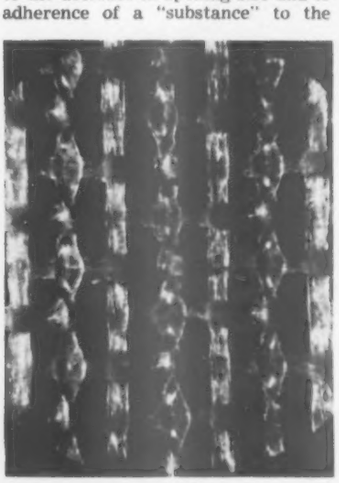

Fig. 1—10XX silk, unused

Materials and Methods

Sieves. Two sets of extra sifter frames were furnished the collaborators. One set was clothed with 135 mesh stainless steel and the other with No. 130 "Nitex," nylon bolting cloth. Each operator used his own frames clothed with 10XX bolting silk as the third medium. The comparative opening sizes are shown in Table I.

Samples. Each operator selected three samples of soft wheat typical of his own area of sufficient size to provide nine aliquots of each. A range in milling quality was suggested as the basis of selection.

Methods. Each sample was to be milled three times with each sieve, a total of nine millings for each or a grand total of 27 millings. The order of milling specified was a randomized pattern with an equal distribution of sieves and samples between days. Each operator was to select the sample size and use his own milling method. When Operator 1 finished his millings, he shipped the sieves to Operator 2, etc., the nylon and stainless steel being a constant between operators. The slack in the cleaner chains was adjusted by each operator to match the chain slack on his silk clothed sieves.

Results were recorded on a form providing space for the weights of all fractions and for recording other milling data.

Operator 5 was selected to run a series of bolting tests on a laboratory shaker using the same sieving materials and two soft and one hard wheat (sample A) samples of his choosing. This consisted of milling 1600 g. samples through the breaks and through the first reduction rolls, the stock being recovered immediately after the first reduction. The break flour and bran were discarded. One 250 gr. aliquot was bolted on each sieve for 30 sec. intervals and the throughs weighed. The highest weight collected for any 30 sec. interval was reported. A 54 w. scalp was used over the bolting sieve in all cases. Millings were replicated three times for each sample to produce the stock for the rate of bolting trials, a total of nine millings, with one rate of bolting trial for each sieve for each milling. The mean results of these tests are shown in Table II. The pearling indices, a measure of kernel hardness, are 32.5, 52.0 and 51.8 for samples A, B and C, respectively.

Results

Fig. 5 shows the mean cumulative yield of flour streams through the three kinds of sieves for three operators and all samples.

Table III shows the average of three operators and all samples for milling data other than flour streams.

Table IV shows the analysis of variance of the data submitted by the three operators included in the results.

Discussion of Data

It is evident from Table IV that different bolting sieves exert a highly significant effect on the results obtained on the Buhler laboratory mill. All recorded observations but one (rate of milling) were significant beyond the 1% point and that one was significant at the 5% level. The significance obtained in the case of bran weight was due to Operator 1.

Since each operator used samples of different wheat and different size, it is natural to expect the high level of significance due to operators. The significance of sieves x operator interaction is generally much smaller than the differences due to sieves. Operator 1 obtained a different pattern of results with respect to bran weight, % patent and rate of milling and these are reflected in the large sieve x operator interaction for these measurements. A probable cause for

(Continued on page 18a)

Fig. 2—10XX silk, 3rd break section after use.

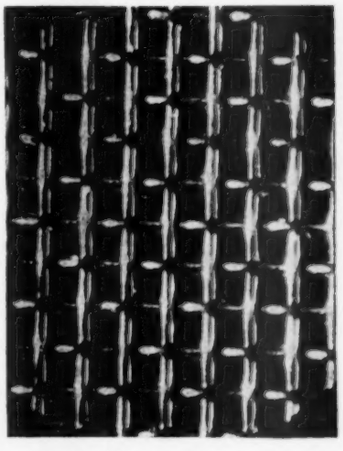

Fig. 3—135 mesh stainless steel unused.

Table I—Comparative Opening Sizes and Related Data of Sieves Used

Type of sieve	Aperture opening, in.	Threads per in.	Mean No. openings, sq. in.	Sq. in. open area/sq. in.	% More open area than silk
10XX Silk	.0053	108	11,664	.328	...
130 Nitex	.0051	130	16,900	.440	34.1
135 S. Steel	.0051	135	18,225	.474	44.5

Table II—Bolting Rates of Reduction Stock

Type of sieve—	Maximum rate of bolting, g./30 sec. A	B	C	Mean	% More than silk
Silk	76.3	50.3	41.0	55.9	
Nylon	88.3	59.7	46.0	64.7	15.7
S. Steel	97.7	75.3	45.3	72.8	30.2

Table III—Mean Values of Milling Data—Not Shown in Figure 5

Sieve—	Flour yield, %	Bran g.	Shorts g.	Patent flour, %*	Flour ash %	Rate of milling g/min.
Silk	70.8	441.3	196.2	62.6	.432	96.7
Nylon	72.2	447.1	82.2	64.9	.435	99.0
S. Steel	72.6	446.0	77.2	66.0	.448	99.1

*% Pat. $= \frac{1B + 2B + 1R + 2R}{\text{Total products}} \times 100$

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Observations on Pneumatic Flour Milling

By Fred M. Abbott
General Mills, Inc.

EDITOR'S NOTE: The accompanying article on pneumatic milling is the text of a paper presented by Fred M. Abbott, General Mills, Inc., Los Angeles, at a meeting of District No. 10 of the Association of Operative Millers. It is reprinted from the AOM Bulletin.

The principles of pneumatic handling have long been understood and, during the last 30 or 40 years, have been successfully applied to the handling of grain, coal and many other materials in a wide range of industries. The pneumatic conveying of mill stock, however, has been a fairly recent development mainly owing to the belief that it would involve excessive power consumption.

It has only been since the war that any real interest has been displayed in this field. When Mr. Anton Meyer of Switzerland started the first pneumatic flour mill in operation in 1944, very few milling experts realized that a revolution in mill construction had taken place. The very interesting story of this pioneering venture is told by John Speight in the June 8 issue of The Northwestern Miller. Since that time, many pneumatic flour mills have been constructed in Europe and throughout the world. Buhler Bros., of Switzerland, alone, are reported to have built more than 250 pneumatic mills and installations up to May of 1953. It is understandable that this activity should have occurred in Europe because of the large amount of milling capacity that had been destroyed during the war. Since the war, there has been considerable new milling capacity built in relatively undeveloped areas. This was largely the result of the wider use of wheat products that resulted from the changes in eating habits that occurred during the war.

The field of flour mill construction has largely been dominated by European companies. In this country the producers of mill equipment have been handicapped because of the lack of a ready market. However, Allis-Chalmers Manufacturing Co. is at present in the field of pneumatic mill construction.

As early as 1945, General Mills, Inc., became interested in the possibilities of pneumatic handling of mill stock. Under the able direction of the late Henry S. Crosby, then director of engineering, a study was made and in cooperation with allied industries, plans were prepared and construction was begun in Los Angeles on a modern flour mill in which pneumatic conveying was to be employed in handling the mill stock and finished flour. It is necessary to look at this project in retrospect in order to appreciate the courage of this undertaking. The development work that took place in England and Europe was first proved in relatively small installations and over a considerable period of time.

Principles of Pneumatic Conveying

Before considering the problems of pneumatic conveying as related to flour milling, let us consider briefly some of the principles involved. First, it should be recognized that there is no distinct line of demarcation between the common exhaust system in which moderate weights of material are conveyed and the so-called pneumatic systems that operate with higher ratios of materials to air.

The action of the air with respect to the stock can best be illustrated by considering the action of a free-falling body. If a body is allowed to fall freely in air, its speed of fall will increase until the resistance of the air is equal to the force of gravity on the body. From that moment, the body will continue to fall at a constant speed known as the terminal velocity. From this, it would be evident that the terminal, or floating velocity, of material in a vertical pipe depends largely upon the size and specific gravity of the conveyed material and, in many cases, upon its physical shape. For example, the terminal velocity of lead pellets would be much greater than the terminal velocity of a light bulky material such as cotton.

If the falling body were to be introduced into a rising air current, the same physical forces would apply and the speed of fall with respect to the moving air would reach a constant value. As the speed of the air currents increased, the absolute downward velocity of the body would be reduced by an equivalent amount. From this, it is evident that in order to obtain an upward movement of the body, the velocity of the air must be greater than the terminal velocity of the body.

In order to convey heterogeneous material, the air velocity must be greater than the terminal velocity of each of the particles. In order to convey horizontally, the air velocity must be still higher because of a tendency of the particles to ride the bottom of the pipe as a result of the force of gravity. In a horizontal pipe, a low velocity would allow a separation of the material from the air stream and, in a short time, the pipe would choke.

Normally it is a fairly simple matter to select a fan capable of providing air currents of a given speed for any required exhaust system. The pressure losses in the pipes can be calculated by applying well-established air laws and, from these calculations, we can select a fan which will give the required pressure and air volume. When, however, a high concentration of material is introduced into the air currents, the normal laws of airflow no longer apply. The pressure losses in the piping are increased because of the extra force necessary to overcome the friction of the material against the inside of the pipes. As indicated before, this effect is considerably greater in horizontal pipes because even though the airspeed is sufficient to keep all the material moving, the particles tend to drag along the bottom of the pipe.

The available static pressure in a pneumatic conveying system is used up in the pressure losses in the sys-

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tem plus the pressure loss in the initial acceleration of the air and the material to conveying velocity. This important loss is due to the fact that an air current is a very inefficient means of accelerating material. The subsequent pressure losses are largely determined by the physical characteristics of the system. For example, there is a marked loss of pressure at each change of direction in the pipes. At the elbows, there is a tendency for the stock to stick to the sides of the pipe and the air following the line of least resistance tends to bypass this material. The loss of pressure at the elbow is greater with floury stock than with material such as wheat which tends to bounce around the elbow.

As we have just noted, when horizontal pipes and bends of about 90 degrees are employed, the airspeed must be relatively high in order to maintain the material in suspension. Inasmuch as the pressure loss increases with the square of the air velocity and the power required varies with the cube of the air velocity, it is evident that in order to obtain the greatest economy of operation in the system, it is essential to design for a minimum airspeed which would result from the minimum of horizontal runs and elbows.

Equipment Required

Materials may be conveyed in a fan system either by a direct system where the material passes directly through the fan, or else by an indirect system where the fan furnishes the current of air for conveying, but the material does not pass through the fan. The material may be conveyed either in a single or multiple pick-up system.

Regardless of the system used, there is certain equipment that is common. In general, the system will consist of a fan, collectors, piping and feeders. Depending on the velocities and pressures required, the fan can be an industrial exhauster type, an axial-flow propeller type, or a positive displacement type. The collector is usually a cyclone separator or a bag dust collector or a combination of both. The cyclone separators are essentially cylindrical in shape with a long conical hopper. The air and material enter tangentially near the top. The centrifugal force caused by the whirling action of the material and the air causes the material to be forced outwardly through the air and to settle in a conical hopper while the relatively clean air passes up through a central cylinder to be discharged.

The modern cyclone separator has been developed to a point of very high efficiency. Nevertheless, in most cases, it is desirable to discharge the cyclone separator into a bag filter even with cyclone efficiencies of better than 99%.

In designing a pneumatic conveying system, special attention should be given to the stock feeders. This becomes quite evident when it is considered that the system must be designed to handle the maximum load. Therefore, a uniform rate of feed will result in economy of design and improved operation.

Types of Systems

Pneumatic conveying systems have, by popular usage, been designated as high pressure, low pressure and intermediate pressure types. The high pressure type, as the name indicates, consists of a high pressure-high velocity system in which there are both vertical and horizontal transport lines. The low pressure type takes advantage of the relatively low velocity required in a vertical lift. No horizontal transport is used in this system. This system requires the use of a mechanical device to impart the initial velocity to the stock at the beginning of the vertical lift. In a sense, the low pressure system is merely a pneumatic elevator. The intermediate type consists of a combination of the high and low pressure systems designed to meet special conditions.

Much has been written regarding the advantages and disadvantages of the various type systems. In fact, we might go so far as to say that some of the claims are quite contradictory. Most of the controversy pertains to the power costs of one system versus the other. In this regard, we would like to point out that if a person is interested only in the power cost of conveying material, pneumatic conveying should not be considered in preference to mechanical handling. In regard to the comparative power cost of the high pressure versus the low pressure systems, it has been our experience that the latter has the advantage. This, we feel, should be evident from the foregoing discussion

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of the principles of pneumatic conveying.

High Pressure System

In any mill, whether the stock is handled pneumatically or mechanically, most of the handling occurs in conveying the stock from the roller mills to the sifters. In the high pressure system, the stocks are conveyed from the roller mill hoppers through horizontal pipes to vertical pipes usually placed along the walls of the mill. They are then elevated to the top floor and into horizontal pipes which carry the stocks to the cyclone separators. The high pressure system has an advantage in that it provides greater flexibility in the layout of the mill and in the location of the equipment. The major disadvantage of the system is that in the process of conveying through horizontal pipes and at least 3-90° elbows, it is necessary to maintain a relatively high air velocity in order to prevent the stocks from settling out. To illustrate the effect of the stock riding the bottom of a horizontal line, it has been found that the capacity of such a line can be increased by admitting auxiliary air into the bottom of the horizontal line at intervals in such a manner that the stock will move through the pipe in leap from fashion, thus holding to a minimum the contact between the stock and the pipe.

Another disadvantage is that a choke occurring in any part of the conveying system involves opening up the lines and cleaning out the horizontal sections. It is possible to minimize this difficulty by installing a pressure operated diverter that is held in operating position by the system static pressure. A drop in static pressure caused by an overload in a given line will cause the diverter to release enough stock to prevent the line from choking up. In most cases, the situation will return to normal as soon as the overload is relieved. However, in a case where the normal load is very close to maximum, it is necessary to hold all the stock out of the line until the accumulated stock has been cleared from the horizontal sections. As a rule, a high pressure system should be designed to handle a 20% overload.

Low Pressure System

The low pressure system of pneumatic conveying of mill stocks originated in Great Britain and has been widely used in many parts of the world. The principal feature of this system, as has been indicated, is the elimination of elbows and harizontal sections in the air lines. The work done by the air is almost entirely confined to lifting the stock through vertical, or nearly vertical pipes. Inasmuch as the stocks fall by gravity from the roller mill hoppers to the verticle pipes, it becomes necessary to change direction of the stock and to impart an initial velocity.

Henry Simon, Ltd., of England, has designed a mechanical device known as a "diffuser" which will change the direction of stock through 90° or more without the use of high speed air and the corresponding pressure drop that would occur in a normal elbow. In effect, this is a means of taking the stock around a corner mechanically instead of pneumatically. Its power consumption is claimed to be as low as 1/30 horsepower, which is less than would be consumed in moving the stock through an elbow. The diffuser consists of a drum containing a number of revolving spokes which prevent the stock from lodging and, at the same time, diffuses it tangentally into the air stream of the vertical pipe. The air needed to carry the stock in the vertical pipe is drawn through the roller mill, at low velocity, and down through the spout and diffuser. This air serves to exhaust the roller mill and eliminates the need for auxiliary air suction on the rolls.

The diffuser, in addition to its primary function, also serves as a diverter for releasing stock in case of a sudden overload or a power failure. Release flaps are incorporated into the diffuser and are held in a closed position by suction. Any drop in static pressure will allow the flap to open and release the stock.

The principal advantage of the low pressure system is the elimination of the elbows and horizontal sections of pipe which are the main causes of the greater power consumption in the high pressure system. The work done by the air is primarily one of elevating the stock. The elimination of the horizontal lines, however, has certain disadvantages in that it results in a system which is less flexible with regards to the layout of equipment. This problem can be minimized by proper design in a new mill but the installation of this type system to service existing equipment can present considerable difficulties. Another disadvantage results from the loss of space on the bottom floor because of the spouting and mechanical diffusers. Also, the positions of the cyclones near the fall often require added height in the building. The manufacturers of the low pressure system of pneumatic conveying recommend a design overload capacity of 10%.

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In the foregoing systems we have considered only the pneumatic transport of stocks from the roller mill hoppers to the sifters. The English

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The flour is picked up from each sifter section by small diameter pipes, 1½ to 2½ in., and is carried to the patent, 1st clear and 2nd clear multiple pickup headers and is elevated to the top floor of the mill where it is discharged from the cyclone separators into the agitators. The headers are so arranged that it is possible to make all flour cuts required for a 65 to 100% patent, from one location. This is accomplished by bringing the individual pickup lines into a flexible connection that makes it possible to move the lines from one header to another in a matter of seconds. By this methods, all valves in the flour system have been eliminated and the flour has a clean sweep from the sifter to the cyclone separator. We feel that we have, in this arrangement, the ultimate in sanitation.

Advantages and Disadvantages

Pneumatic conveying of mill stock, whether by the high pressure system or by the low pressure system, has certain advantages in common. It would be difficult to designate these advantages in order of importance and it is conceivable that certain advantages or disadvantages might not hold true in every case, but in general, they are as follows:

Exhaust of Equipment

The conveying system serves as an effective exhaust on all equipment and, in this manner, eliminates practically all dusting problems while the mill is operating under normal conditions. At the same time, the humidity and temperature is controlled inside the equipment and spouting to the point that the danger of condensation is removed. This control was very effectively illustrated at our Los Angeles mill. The original installation included a mechanical transport system on 1st and 2nd Break stock. This consisted of screw conveyors and screw lifts. The rolls and conveyors were generally exhausted by an auxiliary suction system. It was found that 2,000 CFM of air was not adequate to control the condensation on 4 roll stands, 4 conveyors and 2 four-section sifters. Frequent cleaning was found to be necessary. At a later date a modified low pressure pneumatic system was installed to handle 1st and 2nd Break stock. The condensation problem that had existed was completely eliminated. The improvement was especially evident in the sifter. Since that change, we have had not condensation problem of any kind as far as the spouting and equipment was concerned.

Improved Bolting

The stocks in the process of being conveyed are cooled to within a few degrees of the temperature of the conveying air. This condition plus aeration results in definitely improved bolting of the stock and, in turn, allows for increased capacity of the sifters. This cooling process is assisted by the cooler grinding that results for adequately ventilated rolls.

Infestation Control

The control of infestation has always been a major problem in flour mill operation. Much has been done in the way of equipment and building design to eliminate this problem. One of the greatest steps made to date has been the introduction of pneumatic conveying to replace screw conveyors and bucket elevators. The streamlined construction has eliminated all dead stock and practically eliminated insect infestation.

Building Costs

Additional advantages are claimed by European millers in building and erection costs resulting from the ease and rapidity with which the pneumatic equipment can be installed and the reduced space required.

Flexibility of Operation

The main disadvantage of pneumatic systems in general is the loss in flexibility of operation as compared to an elevator system. The higher power cost of the pneumatic system usually results in the system being designed with a small overload capacity. This makes it difficult to increase the load on the mill. However, it is possible to increase the feed within reason by increasing the available static at which the pneumatic system operates. This will result in a disproportionate rise in power costs above the increase in capacity but the total power consumed should still be at an acceptable figure.

Temperature, Humidity Control

The question often arises regarding the possibility of evaporation losses as a result of the pneumatic conveying of stock. Evaporation from mill

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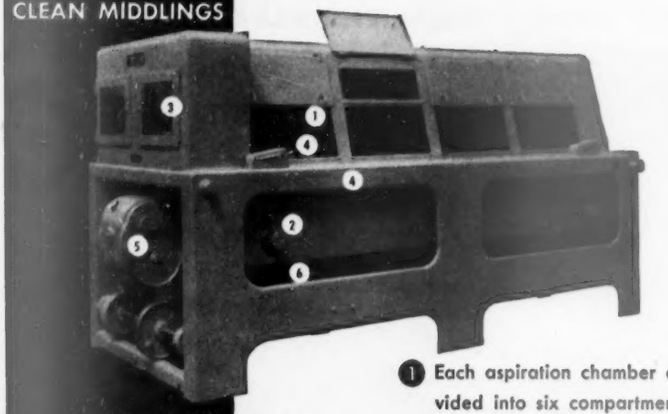

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stock occurs whenever the moisture content of the stock exceeds the equilibrium value which is determined mainly by the relative humidity of the surrounding air. The higher the temperature of the stock and the lower the relative humidity of the conveying air, the greater is the rate of moisture loss from the stock. In order to control the rate of evaporation and the subsequent moisture content of the stock, it becomes necessary to control the temperature and relative humidity in the mill. This can be accomplished by complete or partial air conditioning.

This has been accomplished at the Los Angeles mill by returning part of the fan exhaust plus the necessary make-up air through a series of air filters, heating coils and air washers. Except for extreme temperature and humidity conditions, this results in almost perfect control in the temperature and relative humidity in the mill. The mill air is maintained at 80° F and 57% relative humidity. On occasions, when the relative humidity has gone out of control, it has been necessary to make continued adjustments on the mill to maintain the desired quality of product. The effect of the reduced humidity is very evident on the middling reduction and on the break stock from 3rd Break on down. We can also expect a drop in flour moisture of from .4% to .6%.

The importance of uniform milling conditions was illustrated by an interesting test run that was made at Los Angeles to determine the stability of the mill under controlled condtions. A uniform wheat blend was run on the mill for 120 hours. The mill was set up during the first 8 hours of the run. From that point on, the operators were instructed to keep hands off the mill unless adjustments became necessary to maintain flour quality. There was no deterioration of the flour quality during the run and the flour extraction for the last four hours equaled the average extraction for the run.

The five years in which the Los Angeles mill has been in operation have given us considerable experience in problems of pneumatic conveying related to flour milling. As would be expected, many problems arose, some mistakes were made, and a great deal of knowledge and know-how was acquired. The plant that began as a pioneering adventure in milling has now become a dependable link in the General Mills Organization. The Los Angeles mill has, from the beginning, been a point of interest to the milling fraternity throughout the world, and it has been our great pleasure at Los Angeles to be host to millers from Japan to England and from Australia to Norway. We have always felt a bond of brotherhood in discussing our mutual problems even though at times, because of language difficulties, we had to resort to pictures and sign language. We have found that they were much impressed with the results of our venture and in turn we could not help but be impressed by the many developments they have made in recent years. In all our discussion, we arrive at one conclusion, and that is that pneumatic conveying in flour mills has arrived.

——BREAD IS THE STAFF OF LIFE——

$1 Million Elevator Planned in Kentucky

HENDERSON, KY.—Construction of a grain elevator in Henderson, Ky., is being planned by James C. Ellis, Owensboro, Ky., business man and farmer. It will cost an estimated $1 million.

Carelessness Is Greatest Feed Mill Accident Cause

KANSAS CITY — Carelessness is the most frequent cause of industrial injuries in feed mills, a survey made by the Midwest Feed Manufacturers Assn. reveals. The Midwest association members recently were surveyed on the mill accident situation as the foundation for a safety session at the Midwest Feed Production School in Kansas City.

In answering the question: "What causes the most frequent injury in your plant?" by far the largest number of employers said "carelessness." Running second was improper lifting, loading and pulling. Other causes frequently cited were falls, unguarded machinery and non-compliance with safety regulations.

The most costly accidents are those that result in back injuries, the feed men reported. Next were ruptures, broken bones and sprains in that order.

There is very little in the way of public hazards in the operation of a feed mill, the manufacturers indicated, although some hazard exists in the use of truck lifts, it was pointed out.

Most motor vehicle accidents are minor ones, the survey indicated, with some feed men saying they had greater losses in sales cars than in trucks.

——BREAD IS THE STAFF OF LIFE——

500,000 BU. ADDITION

•LEOTI, KANSAS — Construction has begun on a new 500 000-bu. addition to the Collingwood Grain Company's elevator here, giving the firm more than a million bushels of grain in Leoti. Ten new concrete tanks will be attached to the present structure. The contract for the work has been let to McDowell Construction Co., Denver.

WHEREVER King Nicotine is honored, Havana Cigars are the acknowledged standard, the choice of the discriminating. Tobaccos, workmanship and smooth smoking pleasure are perfection itself . . . that is what makes them "TOPS."

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PURIFICATION

Will It Remain in Its Present Form?

By JOHN SPEIGHT

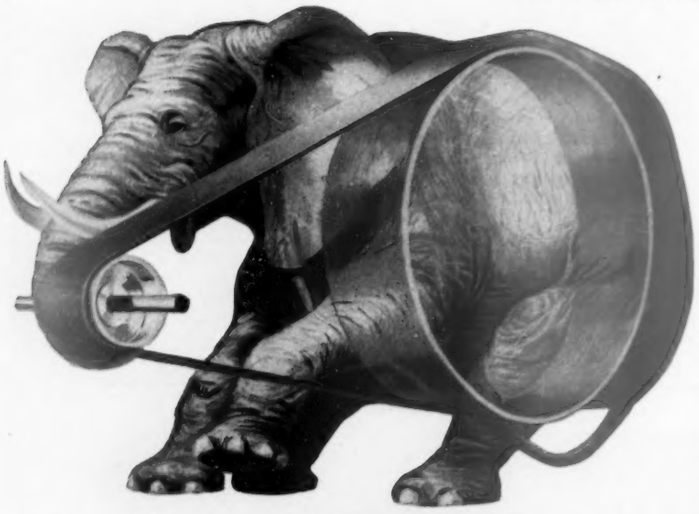
Purification is one of the oldest processes in the making of flour. It was introduced in its present form somewhere about 1854, but it was practiced long before the advent of mechanical milling.

It possibly began when someone in very ancient times, a little more intelligent than the rest, produced a crude form of purifier in the shape of the "Lanturelu," which is considered the forerunner of the fan. This apparatus consisted of three sets of wooden blades fixed horizontally underneath a cone, loosely attached to a spindle, the blades being fixed at certain distances apart, set at an angle, the apparatus being suspended through a hole in the floor through which the material was fed. In falling upon the cone, the material was deflected on to the upper blades, turning them round. The center blades of larger diameter were fixed at an opposite angle to the upper blades, the lower blades of still larger diameter being set at an opposite angle to the center blades. The falling stock turned the blades and so produced currents of air which effected the separation.

According to Pliny, this form of separation was known to the Romans who practiced the art of separating meal into various sizes.

In the latter days of millstone milling, purification was considered very important. There were many types of machines on the market, the manufacturers of which no doubt reaped a golden harvest. In his reminiscences, published many years ago, W. D. Gray, a Scottish youth who emigrated to America in 1865, and who is regarded as one of the founders of the now famous firm of Allis-Chalmers, described some of these men as "Fakirs" and other "artful gentlemen," who "reaped rich re-

EDITOR'S NOTE: The accompanying article on purification is reprinted from the British journal, Milling.



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It Pulls — Leather is strong, flexible, with controlled stretch — gives peak performance on *any* drive.

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wards from the sale of purifiers to susceptible millers."

According to Gray, millers of those far off days installed large numbers of purifiers to work in connection with their millstones in an attempt to improve their flour. The public clamour for better bread was growing, and it was not until some 30 years later, after the introduction of the mechanical purifier, that the demand for still better bread led to the introduction of the roller process.

Purification is a subject rarely in the news these days, but in by-gone times it was all the rage; milling journals were full of it and in their pages one could read of vigorous attacks by opponents and of counter attacks by others who approved of the system. There were many different types of machines, the sponsors of which never hesitated to deny the claims of their competitors.

Principle of Purification

The important principle in purification is the employement of moving air currents to effect the separation of stocks, to grade the product into various sizes, and to remove impure stocks during the process. It has been suggested that air at low pressures, which is mainly used for purification purposes, is difficult to sustain and control, and for this reason it is considered by some authorities to be far from being fully efficient, owing to the non-uniformity of air motion at these low pressures, which is bound to cause some variation in effect in the delicate task of trying to separate and remove some of the gossamer-like impurities from pure stock. The amount of air used for these operations is so small that any deflection in the pressure could easily nullify the process of purification.

The present day purifier is, to all intents and purposes, practically the same machine as invented by Perrigault in 1860 and most manufacturers of these machines follow the same design in principle. Their machines follow the same pattern, that is, they try to perform the two functions of aspirating and separating in one combined operation, and there are many who consider that this is perhaps not the best possible practice and might be improved upon.

Most purifiers are designed with a long, oscillating sieve, above which is an aspirating trunk and expansion chamber. Underneath the sieve is either a worm or shaker conveyor, or simply an arrangement of hoppers.

It is usual to have a common air trunk running the length of the machine, to which are attached control valves for regulating the amount of aspiration needed in each compartment. Some manufacturers have a single air valve, others multiple sets of valves. Between the sieve and air trunk there is usually a series of four main compartments and in some machines these are further subdivided into a series of smaller compartments, but whatever the variation the principle remains the same.

In most makes of purifiers, there are a number of valves attached to the main air trunk inside the machine, in order to control the amount of air needed for aspiration. The manipulation of these valves is considered to have a retarding or other effect on the total amount of air used; that is, if one closes or opens a valve, the pressure in the remaining compartments will increase or decrease as the case may be; in view of this anomaly, one would have thought that some form of balanced air control would have been a feature of the modern purifier, especially when one considers that this process depends mainly on the uniformity of the air pressure for the successful operation of the machine.

Some form of balanced air pressure—in which, if the amount of aspiration is reduced or increased, an equal amount of air is admitted or otherwise from the outside in order not to disturb the equilibrium in the remaining compartments — has been tried out in the past. One wonders why it has not survived.

The general principle followed in purification is that the finest stock is separated away first, followed by the removal of stocks of gradual increasing size, which means, of course, that he largest size stock, together with its attendant impurities, has to travel down the entire length of the sieve, contaminating the smaller and purer sized stock in its passage. It is a matter of opinion as to whether this procedure is the best possible practice.

To separate and remove the finest stocks first is not, in my opinion, the best possible arrangement. I should have thought the reverse would be the better way, for in nearly all other processes we employ the principle of first removing the largest stocks with their attendant impurities. I have often wondered why it was found necessary to reverse the procedure in the case of purification.

The Efficiency Angle

The efficiency of purification depends on the product being spread evenly all over the full surface of the sieve. At the same time currents of air must be drawn up through the stock traveling along the sieve. The efficiency, therefore, must depend on the uniform air pressure being maintained, the non-uniformity of which

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1. **Uniformly light in color.**
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V-90 CONTRACT
"WE'RE PROTECTING OUR NEXT SUMMER'S SALES NOW!"

Old Timer: "Yessiree! We're insuring against next summer's shelf-life problems now."

Upandcomer: "You mean we can actually take out *insurance* against next summer's heat and humidity?"

Old Timer: "Well, in my book, it amounts to the same thing. We've just signed our contract for V-90 for another year. That's as good an insurance policy as I know of. We've made sure that our self-rising flour and corn meal will be able to take the beating that next summer's heat and humidity is going to give them insofar as the phosphate is concerned."

Upandcomer: "How can you be so sure that V-90 will give our flour this protection?"

Old Timer: "EXPERIENCE, Son, EXPERIENCE. We've been using V-90 in our flour for over 15 summers and we *know* that the coating on those V-90 crystals stands up. Another important point is the fact that V-90 releases *less* leavening gas in the critical first two minutes of mixing than any calcium phosphate known. That means better kitchen performance as well as longer shelf life."

Upandcomer: "With a record like that, I know what you mean when you say you've insured next summer's shelf-life with V-90. I suppose all millers do the same?"

Old Timer: "Practically every one. They know they're safe . . . they know they're sure with V-90!"

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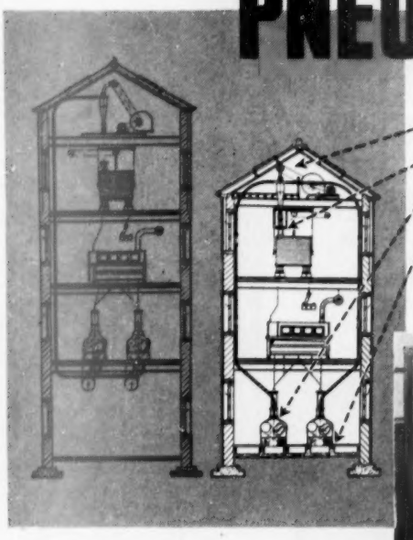


SPACE-SAVING reducing capital expenditure.

CYCLONES mounted directly onto plansifter feed-boards.

MINIMUM LIFT—Stock is lifted vertically through rollermills.

A STRAIGHT FLOW from hopper allows basement-fitted rollermills.

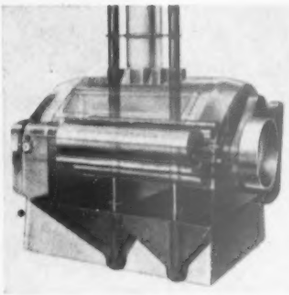
A typical layout of Robinson Receiver Aspirators—Type PFm

Look for these five all-important factors when choosing a pneumatic conveying system 1—overall efficiency, 2—power consumption, 3—freedom from chokes, 4—simplicity of layout, 5—the space it occupies, plus freedom of access to vital machinery.

'Pneu-Flow' was designed to withstand this searching scrutiny. Only 'Pneu-Flow' offers the advantage of lifting stock vertically from the hopper, up through the rollermill. New minimum lift of stock saves power. Absence of vicious bends makes hold-ups a thing of the past. Yes, 'Pneu-Flow' is choke-proof. Better still, 'Pneu-Flow' is available, versatile, sanitary, adaptable to *any* mill or smut department.

SAVING POWER AND SPACE

Compare the savings with the outmoded, conventional layout, left. See how bends are smoothed out—even avoided. Notice, too, how the vertical lift is cut down. 'Pneu-Flow' reduces building heights and power consumption.



A "ghosted" rollermill showing the vertical lift from the hoppers.

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DON'T NEGLECT Elevator Heads

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AVOID CHOKES--But If a Choke Occurs
Examine Head Pulley Immediately

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means, of course, that purification is bound to be somewhat irregular and good only in parts.

I suggest it is a most difficult task to keep the whole of the sieve surface of this type of purifier fully and evenly covered the whole of the working time; if there are any portions of the sieve surface left uncovered, the result is the aspirating air will take the line of least resistance, passing through those uncovered parts without performing its allotted task of removing impurities.

In my long experience in milling, I have yet to see all the purifiers in a mill working fully 100%, that is, with their sieves evenly covered and the aspiration working as it should, for towards the tail end of the machine, where at least from 50% to 80% of the product has been or should have been removed, you can usually find areas of the sieve surface minus any stock. Under these conditions, aspiration can never be regarded as being fully efficient. This is no reflection upon the operational handling of the purifier; the fault is not with the men but in the design of the machine. If from 50 to 80% of the product has been removed in the passage down the sieve, why is it considered necessary to have the same sieve area at the tail end of the machine? The answer is, I understand, that these machines have always been built on this principle. One firm, to their credit, did make an attempt to improve on this idea and obtained a patent for a sieve with a smaller area at the tail end of the machine, which I consider was a step in the right direction and some acknowledgment of the fact that this particular area of the sieve could be reduced with advantage.

Types and Ideas

Some makers of purifiers have recently resurrected the idea of having two or three separate layers of sieves in their machines in an effort to improve purification. This, of course, is not a new idea. In 1879 the German milling engineer, Bucholz, designed and built a purifier with four layers of sieves, and since that time there have been many others of a similar nature. By increasing the numbers of sieve layers the manufacturers claim to have effected a marked improvement in both the grading and aspirating effect over the single layer machine.

There have been many types of purifiers introduced during the past 50 years, but they nearly all followed more or less on the lines of the French, Perrigault machine, with one or two exceptions.

In the very early part of the present century, a Russian milling engineer named Lomoff succeeded in designing a purifier somewhat different from the orthodox machine, and he very nearly succeeded, for his machine contained what I consider to be the essential principles necessary in a purifier. Lomoff, however, like so many others possessed of original thought, could find no support for his idea, which one can only assume must have eventually found its way into the waste paper basket.

The "Still Air Purifier"

In the past there have been many attempts to produce a purifier on original lines—something different—yet for some reason or other they never quite succeeded. One of the more recent attempts to probe the secret of successful purification was sponsored by the Research Association of British Flour Millers, and this was thought so highly of that a Patent No. 574,506 was granted in January, 1946, to Dr. Jones, a member of the staff. This attempt by the Research Association introduces a new and novel feature into purification; there is no relationship between this new idea and the existing form of purifier; it is a complete break with tradition, and as such deserves our full support for two very good reasons: in the first place, for the simplicity of its conception and, in the second, for the application of sound scientific reasoning behind the idea.

This apparatus is known as the "Still Air Purifier," and provides means for separating mixtures of light particles having different terminal velocities in air. Most of the different classes of stock treated on purifiers have varying terminal velocities; for instance, the terminal velocity of (say) germ particles is approximately 240 ft. per minute, while that of a similar sized branny particle is approximately 150 ft. per minute, in still air, so that if a mixture of these particles were simultaneously released from the top of an enclosed space, like a hollow tower, in two seconds time the germ particles would fall 8 ft. and the branny particles only 5 ft. At the bottom of the tower, there is an arrangement of valves which deflect the product one way or the other into their respective discharge outlets, these valves being synchronized with the inlet valve at the top of the tower which delivers a supply of the product at intermittent intervals.

The product with the highest terminal velocity reaches the bottom first, and is discharged, then the deflector valves are moved into a reverse position to allow the product with the slower terminal velocity to be discharged through the alternate outlet.

In this form of still air purifier, we have the germ of a great idea capable of being developed very much further, for I not only consider it points the way to improved purification, but also indicates it may be applied in other processes of manufacture.

Electricity and Radio Active Impulses

As the use of electricity increases, one cannot help but wonder why no attempt has been made by the large concerns manufacturing electrical equipment to design a purifier incorporating electrical energy as the means of removing the unwanted product. Frictional electricity, of course, has been employed in purifiers in the past without success. In 1880 two Yale university students named Smith and Osborne invented a so-called electric purifier. These students were one day visiting a local flour mill when they noticed that the driving belts had branny particles attached to them as they traveled, and this gave them the idea of an electric purifier. The principle employed was frictional electricity, produced by an ebonite roller, revolving and rubbing against a wooden block to impart the frictional electricity to the surface of the roller, which slowly revolved and in doing so attracted the light particles from the surface of the sieve and held them until they were removed by means of a brush. Some 30 years later, a German firm produced a similar type of machine. In each case, however, the idea failed to survive.

As this is the age of electricity, I suggest that one of the huge organizations interested in manufacturing electrical equipment might with advantage turn their attention to the development of an idea recently suggested of employing radio active impulses as a means of separation.

How to Get Best Performance From Elevator Conveyor Belts

By A. F. Matheis

Assistant Vice President
Thermoid Co., Newton, N.J.

Properly selected, installed and maintained, the elevator conveyor belt with buckets is one of the wheelhorses of bulk materials handling. A versatile, compact, easily-integrated connecting link, this type of conveyor offers engineers great flexibility in solving materials handling problems. Continuous in operation, the unit fits in with and maintains or improves the efficiency of continuous systems. It occupies little floor space; adapts easily to out-of-the-way places—against a wall, for example.

But to take fullest advantage of the benefits which these units can bestow, a few simple rules for selection, installation and maintenance must be observed.

Selection

First-rate performance of the elevator conveyor belt hinges on proper allowance for such interdependent factors as material to be conveyed, height, bucket spacing, belt speed.

Material to be conveyed will determine choice of elevator type (boot loading or continuous bucket), bucket shape, size and spacing, kind of bucket. For instance, a material that is light, soft and finely ground can be handled by large buckets, closely spaced, made of light-gauge, inexpensive metal. Material of these specifications will fill each bucket nearly to capacity. If the material is corrosive, a corrosion resistant bucket shodul be used.

The centrifugal discharge or boot loading elevator (see Fig. 1) is best suited to free flowing materials although lumpy materials up to 3-in. diameter often are handled. The unit is usually vertical and the buckets are filled by "digging from the boot."

On the other hand, heavy, hard, lumpy materials are usually best handled by continuous bucket elevators which are fed directly from a loading chute. To facilitate loading and discharge, these elevators usually are inclined, the belt being supported on the up-run by flat carrier pulleys. In discharge, the bottom and sides of the bucket ahead form an auxiliary discharge chute for material from the bucket above. The buckets must be large and wear-resistant.

Height the material is to be raised should not, in general, exceed 75 to 80 ft. because of the danger of swaying.

Bucket projection should be watched and kept as small as possible consistent with good capacity. The farther the bucket extends out from the belt, the greater the stress on the bolts holding the bucket to the belt and the greater the possibility of the bolts pulling out. Thus, the extent of bucket projection also affects belt thickness—the greater the leverage on the bucket bolt heads, the more plies are required to keep the bolts from pulling through. (See Fig. 2).

(Continued on page 15a)

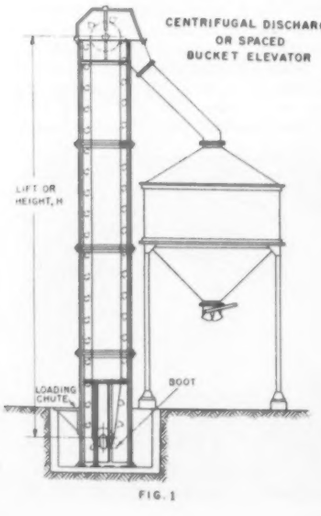


FIG. 1

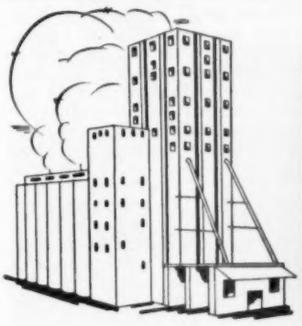
Fig. 2

Minimum Plies for Various Bucket Projections

Note: The leverage on the bucket bolt heads, due to the digging action and the load, increases with greater bucket projection, so that more plies are required to keep the bolts from pulling through.

Materials Carried, Type of Service, Maximum Lump Size	Bucket Projection in Inches 3	4	5	6	7	8	10	Belt Fabric
For Centrifugal Discharge or Spaces Bucket Elevators Minimum Belt Plies								
Light, Free-Flowing Materials	4	4	5	5	6	6		28 oz.
Low Speed Grain Elevators								or 32 oz.
High Speed Grain Elevators				5	6	6		32 oz.

Fourth in a Special Series



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You get a truly economical grain fumigant. You get a fumigant that will give better and more consistent results at a cost as low or lower than the cheapest available.

Another way to say this is, "You can treat a bin of grain with Weevil-Cide as cheaply as you can with the lowest-priced fumigants available." Perhaps the best way to demonstrate this is to figure costs using the lowest current prices and the dosages recommended by the manufacturers.

If all fumigants were equally effective, then cost-per-gallon would determine the cheapest. **But this isn't the case.** The fact that all fumigants are **not** equally effective is recognized by both the fumigant manufacturers and the Federal government. The dosages shown on the labels must be approved by a department of the government.

The dosages used in these calculations are lowest on the labels of 80% carbon tetrachloride — 20% carbon bisulphide mixtures and for the same mixture with 5% of ethylene dibromide added. These mixtures and Weevil-Cide, a fireproofed carbon tetrachloride—carbon bisulphide mixture, account for the bulk of fumigant usage. They are also cheapest.

For average-sized (10,000 to 20,000 bushels) concrete bins the dosage given for the first two types is 2 gallons per thousand bushels **plus twice this amount** for both the **first and last drafts.** This averages 2.2 gallons per thousand bushels. The dosage for the same size bin is 1½ gallons for Weevil-Cide —no hidden dosage necessary.

All freight is figured from Kansas City to Chicago. The prices are those in effect October 1, 1954. The less truckload price for Weevil-Cide is our highest priced quantity, less than 500 gallons.

LESS THAN TRUCKLOAD IN 5-GAL. DRUMS

	80-20	80-20 PLUS ETHYLENE DIBROMIDE	WEEVIL-CIDE
Price Per Gallon	$1.84	$2.10	$2.10
Freight	.21	.21	.21
	$2.05	$2.31	$2.31
Dosage	2.2	2.2	1.5
	410	462	1155
	410	462	231
Cost Per 1000 Bu.	$4.510	$5.082	$3.465

CARLOAD IN 5-GALLON DRUMS

	80-20	80-20 PLUS ETHYLENE DIBROMIDE	WEEVIL-CIDE
Price Per Gallon	$1.51	$1.81	$1.90
Freight	Delivered	Delivered	.10
	$1.51	$1.81	$2.00
Dosage	2.2	2.2	1.5
	302	362	1000
	302	362	200
Cost Per 1000 Bu.	$3.322	$3.982	$3.000

LESS THAN TRUCKLOAD IN 53-GAL. DRUMS

	80-20	80-20 PLUS ETHYLENE DIBROMIDE	WEEVIL-CIDE
Price Per Gallon	$1.59	$1.85	$1.95
Freight	.21	.21	.21
	$1.80	$2.06	$2.16
Dosage	2.2	2.2	1.5
	360	412	1080
	360	412	216
Cost Per 1000 Bu.	$3.96	$4.532	$3.24

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	80-20	80-20 PLUS ETHYLENE DIBROMIDE	WEEVIL-CIDE
Price Per Gallon	$1.26	$1.56	$1.75
Freight	Delivered	Delivered	.10
	$1.26	$1.56	$1.85
Dosage	2.2	2.2	1.5
	252	312	925
	252	312	185
Cost Per 1000 Bu.	$2.772	$3.432	$2.775

These calculations—based on actual dosages as stated on the labels and on the lowest competitive prices available—show necessary difference of 60c in delivered cost to match the low cost of Weevil-Cide. **And at that difference, or at any difference, they can't match the record of Weevil-Cide for consistent results.**

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This reader service department announces the development of new and improved products, new services and new literature offered by manufacturers and suppliers. Claims made in this department are those of the firm concerned. Use the accompanying coupon to obtain the desired information.

No. 5016—Live-Roll Scalper

The development of a "live-roll" scalper, designed to give greater capacity per given floor area, has been announced by the Superior Grain Separator Co. Officials said that the

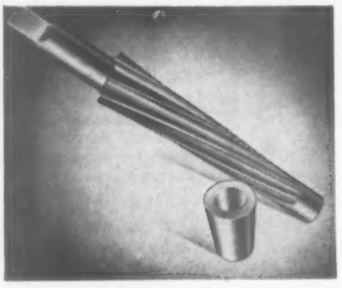
machine has successfully handled up to 1,500 bu. of corn per hour, 2,500 bu. barley, 3,200 bu. wheat and 300 bbl. of rice. The scalper has a 36x35 in. bed of rollers with washers mounted between spacers, all turning in the same direction and powered through a positive chain drive. The bed is self-cleaning. An air system for partial aspiration is an integral part of the frame; however the scalper can be supplied without air. The company states that the dust-tight unit is self-contained; measures 62 in. high, 42 in. wide and 66 in. long. It requires a 1½ h.p. motor; ½ h.p. if used without air. To secure more complete details check No. 5016 on the coupon and drop it in the mail.

No. 5024—Wound-Rotor Motor

What is believed to be the first rib-type enclosed, fan-cooled wound-rotor motor to be made with slip rings, brushing rigging, rotor and stator inside a single frame enclosure has been announced by Allis-Chalmers Manufacturing Co. The motor bears the Underwriters' Laboratories label and is available at 1,800 rpm and slower speeds, in frames 284 to 505, in standard enclosed or explosion-proof construction. In general, the new motor is applicable where very low starting current, high starting torque, smooth acceleration, jogging or variable adjustable speed dictate the use of a wound-rotor motor and where moist, dirty, corrosive, or hazardous atmospheres require a totally enclosed motor, the company claims. The frame of the motor has an extended front end (for heat dispersal) to include the slip rings, brushes and brush rigging in one enclosure. Construction features of the motor are described in leaflet 51R8195, a copy of which is available on request. Check No. 5024 on the coupon and drop it in the mail.

No. 5007—Bushing

The Sioux Metal Products Co. has announced the production of a new repair item for screw conveyors. Called the Hercules bushing, this tapered malleable bushing is said to eliminate conveyor chatter and costly wear at coupling bolts. Worn out connections are reamed with a special high speed reamer and fitted with



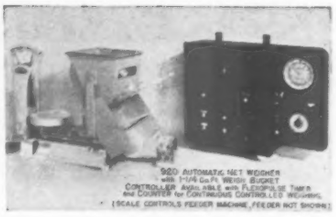
opposing Hercules bushings without increasing connecting bolt size or weakening the conveyor shaft, it is claimed. The average conveyor flight can be completely equipped with these bushings in a few hours. These tapered bushings are available in various other materials for special applications and can be used on old or new installations. They provide a constant snug-fitting connection that will not chatter or wear, the company states. The bushings themselves absorb the wear. To secure more complete details check No. 5007 on the coupon and drop it in the mail.

No. 6138—Lift Trucks

The Baker-Raulang Co. has announced the addition of two new gas powered fork lift industrial trucks to its line. They are called the FD 50 and FD 60. According to the company, the FD 50, rated for loads up to 5,000 lb., and the FD 60, rated for loads up to 6,000 lb., use less than 5 gal. of gas per day. New design features incorporated in both the trucks include: worm-gear driven power axle inching control and a transmission with variable voltage, direct current generator integral with the engine. It generates power for the series motor mounted on the power axle. Further information is available by checking No. 6138 on the coupon and dropping it in the mail.

No. 6139—Net Weighing Machine

A new automatic net weighing machine with load discharge timer and counter for all types of free-flowing materials has just been announced by the Exact Weight Scale Co. The weigher is fed the free-flowing commodity by a vibratory feeder until the predetermined amount is in the weigh bucket. The bucket will not discharge its contents, however, until a pre-set time interval has elapsed. The counter unit



records the number of weighments, and shuts off the operation when a pre-set number of loads have been made. A pushbutton control panel also permits manual control when desired. The scale has a one-to-one ratio dynamically balanced lever. Control rheostats provide adjustment of both fast and slow rates of feed to weigh bucket. Unit capacities are available up to twenty-five pounds, with calibrations in either metric or avoirdupois. To secure more complete details check No. 6139 on the coupon and drop it in the mail.

No. 6135—Bin, Hopper Vibrators

Cleveland Vibrator Co. announces the development of two new air vibrators. The 1 in. and 5 in. piston diameter type F air vibrators bring the total availabilty of bin vibrators to eight different sizes. The 1 in. type F is a light weight unit, while the 5 in. is a heavy-duty long stroke unit for larger bin applications where arching, bridging and sticking conditions are extreme. All type pneumatic vibrators are suitable for helping move granular and powdered materials, including chemicals, feeds, grains, etc. All vibrators operate on 25 to 100 p.s.i.g. continuous line pressure. Maximum efficiency is obtained at 80 p.s.i.g. They are designed for continuous or intermittent operation, and can be used on bins containing from one to several hundred tons of materials. The vibrator, operating valve, automatic lubricator, mounting base plate, hose and fittings are all obtainable in kit form. To secure more complete details check No. 6135 on the coupon, clip and mail it.

No. 6132—Dump Bucket

The Prime-Mover Co. has announced that its Model 15 Prime-Mover is now available with a stainless steel dump bucket. The special unit is furnished for hauling waste and materials in process in plants where acids, salts, and other corrosive materials are handled. The large dump bucket has a liquid capacity of 10 cu. ft. and the Prime-Mover with the bucket has a load capacity of ¾ ton up 20% inclines. The rounded stainless steel bucket with smooth rolled edges is easy to clean and rinse. The machine's design has the dual purpose of extend-

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☐ No. 5007—Bushing	
☐ No. 5009—Hammermill	☐ No. 6135—Net Weighing Machine
☐ No. 5016—Live-Roll Scalper	
☐ No. 5024—Wound-Rotor Motor	☐ No. 6138—Lift Trucks
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ing and preventing contamination of the materials handled. To secure more complete details check No. 6132 on the coupon and drop it in the mail.

No. 2958—Intercom System

A six-station wireless selective master intercommunications system, requiring no cables or installation, has been introduced by Talk-A-Phone Co. Said to be the first completely selective wireless intercom system, the Talk-A-Phone LCM-8806 offers many features of the company's conventional line, including a six-channel selector, which enables each unit in the system to transmit to any of the six separate channels and receive calls on any channel it selects to use. As many as three separate conversations can be carried on simultaneously over the six-station system. Wireless selective communication, enabling any master to select and carry on a conversation with any other master separately, is another of the features. The "Sonic Gate" circuit suppresses line noises and hum while the system is in actual operation as well as when in stand-by position, it is claimed. The unit is adaptable for additional master units, starting with two masters. It is suitable for instant or temporary installation. The unit plugs into the conventional electric outlet. For more complete details check No. 2958 on the coupon and mail it.

No. 5009—Hammermill

The Dixie Machinery Manufacturing Co. has announced an addition to its line of open- and closed-throat hammermills. The new mill, called the Dixie Clipper, is designed for the custom miller and will grind bulky, free-flowing, friable or fibrous materials, the company states. Standard equipment includes a device, known as the "Minute-Miser," to permit screen removal and replacement with mill in operation. The device consists of a safety plate, which automatically releases screen retaining cage and shields revolving hammers when it is lowered. As the screen is removed or inserted, the safety plate remains in a position which provides full protection for the operator. The mill operates with a 50 to 75 H.P. motor, at 3,600 R.P.M. When equipped with the largest motor, it has an over-all length of approximately 96 in. Over-all height is 38 in. and over-all width, excluding feed table, is approximately 29 in. The width inside grinding chamber is 17 in. Check No. 5009 on the coupon, mail it and more details will be sent to you.

No. 6146—Conveyor Equipment

An illustrated catalog showing various sizes and types of conveyor equipment has been released by the Continental Gin Co., manufacturer of feed mill, grain elevator and fertilizer plant conveyor systems, bucket elevator units and V belt drives. Engineering data is included to guide the user in the proper selection of size and type of conveyor and accessories. Tables and engineering information also are included for determining proper speeds and horsepowers. Also illustrated are many unusual types of conveyors and their applications. Check No. 6146 on the coupon, clip and mail it to receive the catalog.

Martin Schuler, USDA Grain Inspector, Retires

KANSAS CITY—Martin Schuler, supervisor, in charge of the Kansas City office of the grain inspection service of the U.S. Department of Agriculture, retired Oct. 30, after 37 years of service with the department. He has been succeeded by Joseph E. Elstner, assistant supervisor.

The Kansas City office, with a staff of 25 employees, supervises the inspection of grain in Kansas and Missouri.

ELEVATOR CONVEYOR BELTS

(Continued from page 13a)

As for bucket spacing, the closer the buckets are placed to each other, the greater the capacity of the belt for equal speeds. However, also increased are the load on the belt and the number of bolt holes which weaken the belt. If buckets are set too close together, a belt of such thickness may be required to support the load that either excessively large diameter pulleys will in turn be required or the belt will be short-lived from over-flexing over a normal-sized pulley. (See Fig. 3).

The problem of loading and discharging the buckets may be troublesome with certain types of materials. Discharge pattern may often be improved by a faster moving belt that will throw the material clear of the

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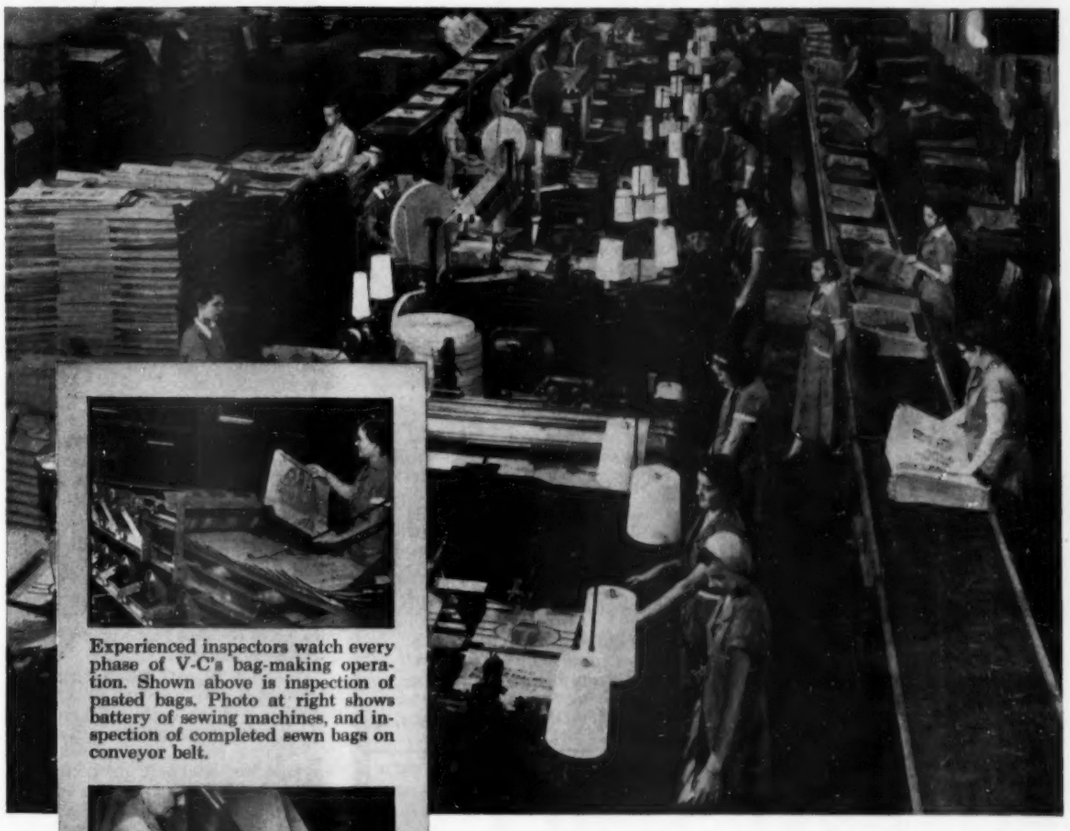

Experienced inspectors watch every phase of V-C's bag-making operation. Shown above is inspection of pasted bags. Photo at right shows battery of sewing machines, and inspection of completed sewn bags on conveyor belt.

Experienced operators carefully apply sleeves in the manufacture of sewn-valve bags. Great care is necessary in this operation. An improperly inserted or aligned sleeve can cause sifting after the bag is filled.

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Fig. 3

Maximum Plies for Standard Pulley Diameters

Head Pulley Diameter	Maximum Plies	Minimum Foot Pulley Diameter (approx.)
20"	5	15"
24"	6	18"
28"	7	21"
30"	8	22"
36"	9	26"
42"	10	30"
48"	12	36"
54"	13	40"
60"	15	42"

bucket. Belt speed also affects belt capacity and thickness.

Method of installation is the second crucial step; it should supplement, but it could cancel out, the good results gained by optimum blending of selection factors. During installation, attention must be given to proper splicing, alignment, loading, tension, safety devices and pulley lagging.

In general the sequence of installation steps is as follows: Belting should be mounted on a strong wooden or metal stand and metal bar at point of installation. To punch bolt holes, draw a belt on to a temporary table, bucket side up. Mark bucket spacings with steel square in pencil. Make a template of bolt holes or place punched bucket over spacing lines and mark position of bolt holes. Punch and cement holes to protect the belt carcass thus exposed. They should provide a snug fit for the bolts. Push bolts through belt and place on each a leather washer. Place buckets over bolts and tighten nuts with round side next to buckets. The use of lock washers is recommended. Norway flat head bolts meet most requirements. Use ¾ in. bolts on 4-ply belts, 1 in. bolts for 5 and 6 ply and 1¼ in. for 4 and 8 ply.

Clamp joint—The type of belt splice depends on the thickness of the belt and the severity of service. For belts of 5-ply thickness or under, the bolted clamp joint may be used. Belt ends must be bent outward at right angles to form a ridge which is then bolted between a bar clamp. This joint is strong and resistant to shock and the bend is well tolerated by thin belt.

Lap joint—A lap joint splice is commonly used on grain and continuous bucket elevators. Belts must be lapped so pulleys "fall off" shoulder during running. In other words, the end of the lap in contact with the pulley should be the last part of the joint to pass over the pulley. The lap extends a distance of from 3 to 5 buckets and is secured by the same bolts that hold the buckets. Bolts at end of lap must be tight and belt trimmed close to the bolts. This splice is not suitable for belts over 7 plies thick because it is too stiff to pass tightly over the pulleys and shear-action in the lap may be severe enough to work bolts loose.

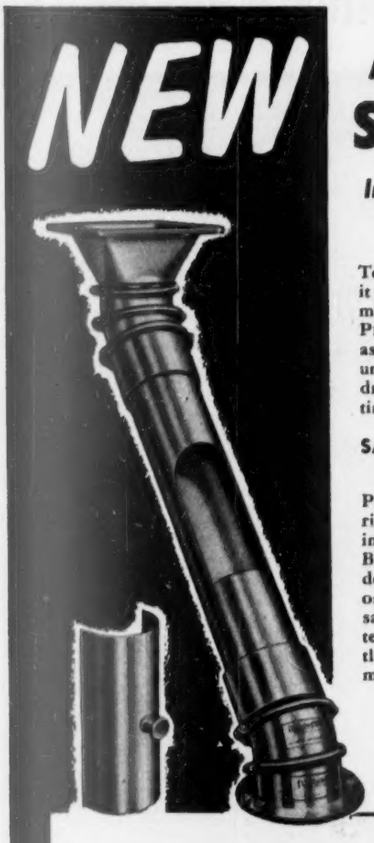
Butt-strap joint — The butt-strap joint may be used on belts of 8 or more plies. After ends are square and butted tightly against each other, a piece of belting is bolted over the ends, covering equal distances on each side of the break. For spaced buckets this piece should be twice the belt width. With continuous buckets the splice extends under two buckets on each side of the butt. A double row of bolts is required at the butted-ends, and may necessitate omission of one bucket. A single row of bolts is placed on each end of the strap. Place one bolt for every inch of belt width, ½ in. bolts for belts under 10 plies, ⅝ in. bolts for over 10 ply.

Plate joint—The plate joint made by bolting plates across the butted ends of the belts, may be used on all belt thicknesses. It is better than the lap and butt strap splice on stiff thick belts because there is practically no shear action.

Alignment is another factor that should be closely watched during installation and thereafter. A crooked-running belt strains pulleys and shafting, wastes power, wears bearings and subjects the belt itself to the danger of being damaged if a bucket should foul on the housing. The feed chute must fill the buckets evenly so that excess material does not pile up on one side of the boot.

And uniform loading, through uniform delivery to the boot, is another very valuable aid to steady, consistent operation. The belt must be protected against the effect of material spilled on up-run or at the head pulley. Such material, in falling down the leg, lodges between the belt and the foot pulley. Where small size material is to be conveyed, flat-type, paddle wheel pulleys are recommended for use as foot pulleys, since they will allow the spilled material to pass off harmlessly. Larger lumps of material, however, require that a protector be placed above the foot pulley. An inverted board or sheet metal V fitted with flexible edges of old belting, touching the inner return side of the belt lightly, will divert larger lumps effectively. Such a protector must be checked and adjusted daily.

Proper tension—enough to overcome slippage but no more—must be maintained whenever the belt is in operation. On inclined elevators too much sag may cause the buckets to snag in the housing. Take-up provision



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should be present on all installations and the same tension must be maintained on both edges of the belt.

As for safety devices, when a choke occurs the head pulley must stop as soon as the belt slows down; otherwise the belt may be damaged or burned. Besides a control to assure this, two others should be installed—one to stop feeding when the bins are full and one to stop the conveyor from delivering to the boot as soon as the elevator motor is stopped. A back stop device to keep the elevator from running backwards under the weight of a load after the power has been shut off may be installed also. This may be done by placing on the end of the head shaft a ratchet wheel which engages a pawl fulcrumed on the beam supporting the head shaft bearing.

Pulley lagging is another useful device on elevator head pulleys since it prevents wear on bucket bolts, particularly when the pulley side of the belt cover is not thick enough to allow the bolt heads to sink in. Lagging also may be used to increase the coefficient of friction between the belt and the pulley to obtain required tension and prevent slippage under the load. Two or three ply rubber covered belting is most frequently used.

Maintenance and Repair

Since operating conditions are often more severe than anticipated and accidental damage occurs more often than many users realize, regular attention is more than justified to guard elevator installations against unnecessary wear and preventable damage. Inspection should be made at least once a week for loose bucket bolts, worn washers, faulty splices, buckets, belts and pulleys. Housings and foot pulley protectors should be constantly adjusted, accumulations dislodged. Anything which might snag the buckets while the belt is in operation must be detected immediately.

And any belt damage, no matter how slight, should be repaired immediately. Belt fabric in the carcass exposed to weather or damp atmosphere will absorb moisture and may even become soaked if the protective cover becomes damaged. In warm weather, this condition leads to mildew and rot; in winter, ice crystals form and gnaw at the fabric from within as the belt flexes. Hence, immediate repairs not only prevent the spread of damage, but also keep out the water which is the natural enemy of the carcass of conveyor belts.

An adequate repair kit includes: sharp cobbler's knives and a stone to keep them sharp, a supply of emery cloth, rubber cement, inner-tube patching rubber, rip-plates, standard belt fasteners and accessories, rags and cleaning fluid. As each belt is installed, remnants should be kept for they will prove useful in subsequent repairs.

Fasteners and rip-plates lend themselves to quick repairs when a deep cut or tear occurs. For smaller breaks in the cover, a piece of remnant cover-stock may be cemented over the break to keep out moisture and dirt until more permanent repairs can be made.

To mend long and deep cuts which go through to the fabric, open the cut, clean out all the dirt, and cement the cut closed, allowing the cement to dry thoroughly before the belt is restored to service.

Where bits of torn cover leave exposed parts with only slight damage to the fabric, remove the loose ears of cover-stock by carefully cutting a curved and bevelled edge around the spot. Then sand edges, apply cement, allow to dry, apply tire patching rubber and finally skive the patch flush with belt cover.

Gouges which have penetrated the belt, or longitudinal rips must be cleaned, sanded, cemented, and reinforced with rip-plates at three-inch intervals.

Transverse rips require similar treatment with standard belt-fasteners instead of rip-plates. Use rip-plates on longitudinal rips only, standard fasteners on transverse rips only.

When holes do not permit use of rip-plates, and fasteners, cut out the hole into the smallest possible rectangle, with its sides parallel to and at right angles to the belt edges. Then, from belting remnants, cut an exact fit for the hole, cementing all edges thoroughly, and insert, securing it with belt fasteners all around the patch.

Vulcanized patches have greater flexibility, strength and permanence than those described above. In preparing a vulcanized patch, work down into the damaged belt as far as necessary by removing progressively smaller blocks of fabric with each successive ply to depth required by the injury. When the patch goes through the belt, work in through bottom ply, just as from the top ply, to meet work from top inwards. Clean, roughen and cement the cavity, fit in blocks of new fabric and, finally, apply the uncured cover. Skive edges of patch flush and vulcanize.

Such patches cannot be made successfully unless the belt is dry because presence of moisture will permit development of internal steam blisters.

Only users of large amounts of conveyor belting will find it necessary to vulcanize their own belt patches. Small users can arrange with belt manufacturers, local firms or neighboring large users for vulcanizing service when required.

INSIDE SCIENCE

The Vital Story of CORN ENRICHMENT

(CORN MEAL—CORN GRITS)

by Science Writer

Since Pilgrim days corn has been a popular food in American diets. Today dishes using corn meal or corn grits are served at breakfast, lunch, dinner.

As scientific information was gathered about this popular grain, it was found that Nature had been bountiful with certain food essentials and stinting with others. Unfortunately, only small amounts of certain vitamins and other nutrients which are essential to human health were found to be present. Furthermore, unavoidable losses occurred when the grain was degermed. Degerming allows the product to be packaged for nationwide distribution without spoiling.

When corn millers realized this situation, they took an important step to correct it. They used enrichment.[1]

Enrichment is essentially a simple process. It restores important vitamins and minerals to whole grain values. And, in the case of whole corn meal, which is naturally low in niacin and iron, it increases the values for these essentials over whole grain levels.

These are the vitamins used in enriching corn meal and corn grits:

Thiamine, also called vitamin B_1, which helps to build physical and mental health. It is essential for normal appetite, intestinal activity and sound nerves.

Riboflavin, also called vitamin B_2. This vitamin is essential for growth. It helps to keep body tissues healthy and to maintain proper function of the eyes.

Niacin, another "B" vitamin, is needed for healthy body tissues. Its use in the American diet has done much to make a serious disease called pellagra disappear.

In addition to the "B" vitamins, *iron* is used in all enrichment of corn meal and grits. And, at the miller's option, calcium and vitamin D may be added.

Our Federal government and many state governments have established maximum and minimum enrichment levels which the various forms of corn meal and grits must meet to be acceptable in commerce. For instance, the Federal Standards for enriched corn meal and enriched corn grits are as follows:

	MIN.	MAX.
	(Mg. per lb.)	
Thiamine	**2.0**	**3.0**
Riboflavin	**1.2**	**1.8**
Niacin	**16.0**	**24.0**
Iron	**13.0**	**26.0**
ADDITIONAL AT MILLER'S OPTION		
Calcium	500.0	750.0
Vitamin D*	250.0†	1,000.0†

*Although an optional ingredient, not considered necessary in corn enrichment. †U.S.P. units per lb.

The Federal Standards further provide that the levels for enriched grits must not fall below 85% of the minimum figures after a specific rinsing test.

The enriching ingredients are combined into a form called premix which millers add during processing so that enrichment is spread evenly throughout the product.

The vitamins used in enrichment are manufactured. Scientists first learned the chemical composition of vitamins, then isolated the pure substance. Then they "built" a duplicate. This duplicate is identical with Nature's product chemically and in biological activity. A vitamin is a vitamin regardless of its source, just as salt is salt whether it comes from a mine or is evaporated from the sea. So efficient is large scale manufacturing that vitamins are available to millers at a lower cost than if they were extracted from natural sources.

The Hoffmann-La Roche people, pioneers in research and manufacture, make top-quality vitamins literally by the tons. In fact, a large percent of the vitamins used in enrichment of corn meal and grits, family white flour, white bread, macaroni products, and white rice, come from the Roche plant. Using amazingly complex processes with scientific production controls, Roche employs modern, special equipment which fills whole buildings, each one a city block square and many stories high.

This article, reprints of which are available without charge, is published as a service to millers of corn meals and corn grits by the Vitamin Division of Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West, Montreal, Quebec.

[1]An excellent color film on the enrichment of corn meal and grits has been produced by Clemson Agricultural College, Clemson, S. C. Widely recognized as an outstanding educational film on food and nutrition it is being shown by many health departments and schools.

Millers of corn meal and corn grits help in the fight against dietary deficiency diseases and in promoting good nutrition when they enrich their products with thiamine, riboflavin, niacin and iron plus calcium.

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COMPARATIVE MILLING RESULTS

(Continued from page 1a)

these differences is the relatively slow rate of milling employed by this operator, a mean of 67.6 g/min. contrasted to 101.7 and 125.5 g/min. for operators 2 and 3 respectively. That the relative differences due to sieves did not remain constant with all samples was apparent in nearly all results. This was also true in the rate of bolting and experiment by Operator 5.

In addition to the data reported in Table III, Operator 2 ran farinograms and viscosities on the composited millings of replicates. The viscosities of sample B were significantly different, and are as follows: Silk 69, nylon 64, stainless steel 59. These differences are likely largely due to the significant increase in flour yield from silk to nylon to stainless steel for this sample, 68.7, 71.0 and 71.9%. Operator 2 commented that he got slightly better farinogram comparisons with the commercial mill with silk sieves.

Examination of the rate of bolting data (Table II) shows large apparent increases with nylon and stainless steel in the maximum bolting rates for all samples. Stainless steel shows a further increase over nylon in two cases, A and B, but not with sample C. These data apply only to reduction stock and may well be different if break stocks are used. The regular millings indicate that nylon was the most efficient bolting medium on the breaks.

The graphic presentations of the mean flour yields of the six Buhler mill streams is of interest primarily because it shows the difference between nylon and stainless steel. In every case nylon yielded significantly more break flour while the stainless steel was a more efficient medium for bolting the reduction stocks. The data suggests that a combination of nylon on the break sifter and stainless steel on the reduction could give the optimum results. Results may assume a different pattern if other opening sizes are used.

Four operators participated in the Buhler millings with different bolting media; however, the mean values and analysis of variance reported are for three operators only. The data for Operator 4 were not included because he did not randomize his millings as instructed. The results obtained by Operator 4 were analyzed separately and in general were similar to those obtained by the other three operators.

Conclusions and Recommendations

Either nylon or stainless steel of the two sizes reported herein are suitable materials to use as sieves in the Buhler laboratory mill. Correlation of results with a commercial unit by each operator will indicate whether or not it is advisable to make the change. In general, an increase in flour yield of 1½% and 2% can be expected from the nylon and stainless steel substitutions respectively. The durability of stainless steel recommends it to laboratory milling. Laboratory experience with nylon sieves has not been sufficiently extensive to determine if they will decrease in bolting capacity with use. With this reservation, nylon and stainless steel are both recommended as superior to silk for use in the Buhler milling of soft wheats.

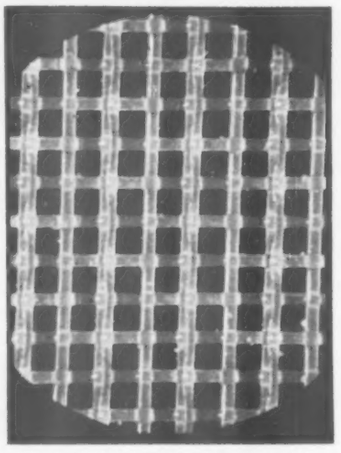

Fig. 4—130 mesh nylon, unused.

Literature Cited

1. Lawson, P. H.—Bolting Cloth Investigations, Vol. 1, Technical Bulletins, Assoc. of Operative Millers, pp. 81-96.
2. Mettson, David F.—A Comparison of Wire and Silk Bolting Cloth, Milling Prod., Vol. 18, No. 1, pp. 1-16 (1953).
3. Seeborg, Edward F.—A Modified Flow Sheet for Buhler Mills; Milling Prod., Vol. 15, No. 1, pp 1, 25 (1950).

Acknowledgements

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**Senior Chemist, Western Wheat Quality Laboratory, USDA, Agr. Res. Service, Field Crops Research Branch, Pullman, Wash.

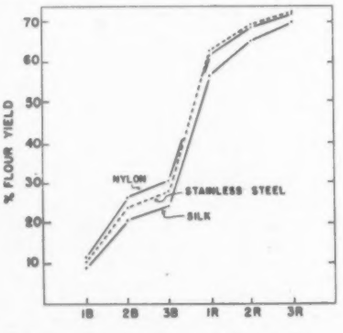
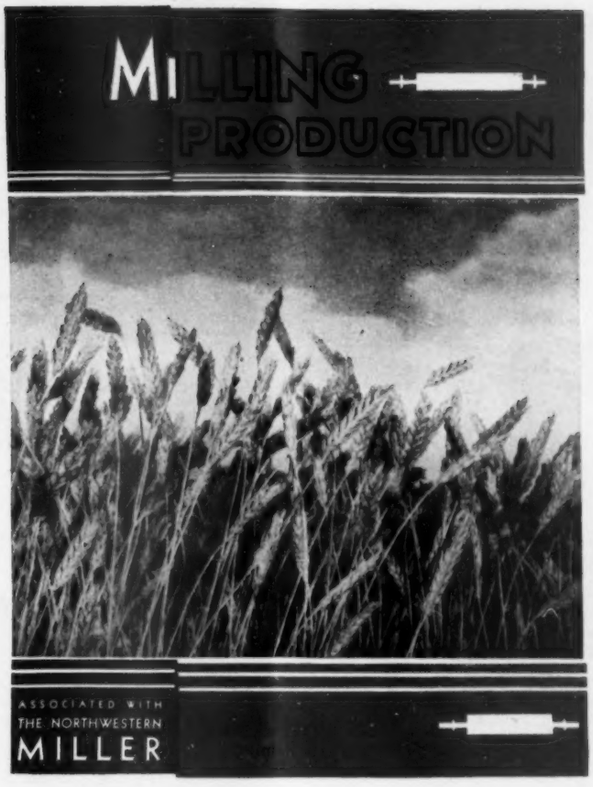


Fig. 5—Cumulative yield of flour streams through different sieves.

Table IV—Analysis of Variance†

	D.F.	1 Break Mean Squares	2 Break Mean Squares	3 Break Mean Squares	1 Red Mean Squares
Sieves	2	18,214.31**	21,352.68**	822.23**	40,101.86**
Operators	2	82,434.90**	246,341.94**	32,032.05**	64,929.71**
Sieves X Op.	4	581.40**	1,187.02**	144.41**	7,577.38**
Error	48	79.20	60.63	24.42	686.35
		2 Red	3 Red	Bran	Shorts
Sieves	2	13,076.53**	8,763.05**	256.09**	6,506.68**
Operators	2	16,037.64**	53,491.57**	220.23**	15,728.34**
Sieves X Op.	4	3,820.20**	2,573.50**	275.13**	658.02**
Error	48	283.26	83.56	31.91	116.04
		Flour yield	% Patent	Rate of milling	% Flour ash
Sieves	2	22.50**	83.48**	49.86*	0.001431**
Operators	2	236.41**	730.20**	22,911.42**	0.099927**
Sieves X Op.	4	3.92**	116.16**	79.23**	0.000220
Error	48	0.68	1.30	14.59	0.000123

†All tests of significance are made considering the operators fixed (i.e., non-random).



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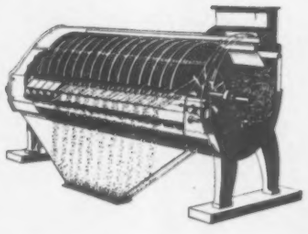

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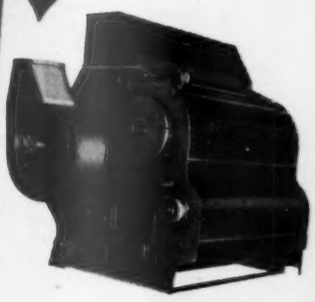

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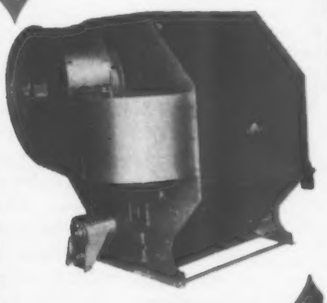

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